



A new species *Grevillea burrowa* (Proteaceae) from the Burrowa-Pine Mountain National Park, North Eastern Victoria

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Introduction

The *Grevillea victoriae* complex remained, until recently, one of the most challenging unresolved complexes in the third largest genus in the Australian flora. The predominantly montane distribution of the complex in south-eastern Australia, with many populations confined to ridges, upper slopes and plateaux, has predisposed the complex over time to natural fragmentation and consequent exposure to strong founder effects, genetic drift and localised selection pressures.

The taxonomic status and affinities of two stands of *Grevillea* allied to members of this complex on the Burrowa Plateau in north-eastern Victoria have remained unresolved and not accounted for by earlier treatments of the complex (McGillivray & Makinson 1993; Makinson 1997, 2000; Molyneux & Stajsic 2000; Stajsic & Molyneux 2006; Stajsic 2010).

Recent studies in *Grevillea oxyantha* Makinson subsp. *oxyantha* demonstrate considerable regional character variation over its wide and diverse habitat range on high montane sites and the southern near-coastal ranges within the Southern Tablelands botanical division of NSW and the ACT. Makinson (1997), having already erected *G. oxyantha* subsp. *ecarinata* Makinson within this complex, suggested that further studies of populations within *G. oxyantha* subsp. *oxyantha* may necessitate recognition of additional subspecies to accommodate this diversity.

Abstract

Grevillea burrowa Molyneux & Forrester sp. nov. is described, illustrated and mapped. This new species is only known at present from two adjoining ridgetops and upper slopes c. 3 km apart in the Burrowa-Pine Mountain National Park in north-eastern Victoria. Its relationships with *Grevillea oxyantha* subsp. *oxyantha* Makinson, *G. oxyantha* subsp. *ecarinata* Makinson and *G. brevifolia* F.Muell. ex Benth. are discussed, as are regional geomorphology, distribution and habitat, etymology and conservation status. The species is assessed as critically endangered on the basis of extreme geographic restriction and projected risk from fire, climatic drying and recruitment failure.

Keywords: Proteaceae, *Grevillea victoriae* complex, morphology, taxonomy, Australia

Makinson (pers. comm. to WMM) has suggested that it may also be necessary to undertake further studies of *G. oxyantha* subsp. *ecarinata*, due to the range of critical characters that have been more closely studied since this subspecies was named.

While we agree that further investigation of both subspecies is required, clarification of variation within, and the conspecific status of, the two subspecies as currently circumscribed is beyond the scope of this paper. It has been necessary, however, to include critical comparison of character state differences between the two subspecies of *G. oxyantha* and the Burrowa Plateau entity, as it had been suggested that this entity could be included within the circumscription of *G. oxyantha* subsp. *ecarinata* (Stajsic pers. comm.). We do not accept this opinion and provide morphological data to support our hypothesis that the new entity represents a distinct species which we describe below as *Grevillea burrowa*.

Affinities and evolution

A comparison of character states of available extant populations (Table 1) indicates the close morphological proximity of *G. oxyantha* subsp. *oxyantha*, *G. victoriae*

F.Muell. subsp. *nivalis* Stajsic & Molyneux and *G. oxyantha* subsp. *ecarinata*. Further, shared character states between *G. oxyantha* subsp. *oxyantha*, *G. brevifolia* F.Muell. ex Benth. and *G. burrowa* indicate a close relationship between these taxa.

The presence in at least some plants of a subacute floral limb face within *G. burrowa* (but not in *G. brevifolia*) suggests that this character state may be derived from the subpyramidal floral limb of *G. oxyantha* subsp. *oxyantha*, a singularly important and defining diagnostic character for this subspecies. Modifications of the pyramidal floral limb are also present in populations of *G. oxyantha* subsp. *ecarinata*.

The geographic and genetic isolation of the Burrowa Plateau population from other closely related taxa in niche habitats at higher elevations has resulted in *G. burrowa* being a relatively uniform entity with a distinctive suite of character states exhibiting some variation in the percentages of floral rachis branching and in the shape of the face of the floral limb between or within subpopulations. *Grevillea burrowa* is a biogeographically isolated and morphologically distinct taxon (see Fig. 2) represented by many thousands of individual plants. We recognise it here at species rank.



Figure 1. *Grevillea burrowa*, illustrating the subacute perianth limb face often found in plants sympatric with plants with an obtuse perianth limb face

Table 1. Summary of major diagnostic characters of *Grevillea burrowo* and allied taxa within the *G. victoriae* complex. Where character states show bimodal distributions within or between populations the lower and higher ranges are provided.

	<i>Grevillea burrowo</i>	<i>Grevillea brevifolia</i>	<i>Grevillea oxyantha</i> subsp. <i>oxyantha</i>	<i>Grevillea oxyantha</i> subsp. <i>ecorinoto</i>	<i>Grevillea victoriae</i> subsp. <i>nivolis</i>	<i>Grevillea victoriae</i> subsp. <i>brindobello</i>
Branchlet shape and indumentum	biconvex or subterete, often with spaced longitudinal ridges, becoming terete, densely subserriceous	terete or subterete, longitudinally ridged, becoming terete, moderately to densely subserriceous or subtomentose	biconvex or subterete, becoming terete, longitudinally ridged in some races, densely tomentose or subserriceous	biconvex, eventually subterete or terete, subserriceous	biconvex, becoming terete, densely subserriceous or subtomentose	biconvex, angular with several longitudinal ridges, subterete or terete, densely sericeous or subserriceous
Leaf upper surface indumentum and venation	initially openly subserriceous, becoming so only along prominent raised mid and lateral veins, imparting a 'silvery' appearance to plants, eventually glabrous, dullish green	initially densely sericeous or subserriceous, becoming glabrous, dull or shiny green, mid and lateral veins level with or below leaf surface, evident or obscure	initially with openly curling villous or subserriceous hairs, becoming glabrous, dull or shiny green, mid and lateral veins level with or marginally recessed in leaf surface, obscure	initially openly subserriceous, soon nearly glabrous, dull green, mid and lateral veins level with or marginally recessed in leaf surface, obscure	initially with scattered, appressed silvery-white hairs, becoming glabrous, mid to dark green, mid and lateral veins conspicuous, reticulum obscure to conspicuous, usually evident	semi-glossy or distinctly glossy, glabrous but for sericeous hairs just above petiole, lateral veins raised, evident to conspicuous, reticulum absent
Leaf lower surface indumentum and venation	densely sericeous or rarely subserriceous, mid and lateral veins raised, obvious, reticulum irregular or absent, epidermis obscured	densely sericeous or subserriceous, mid and lateral veins evident or obscure, reticulum absent, epidermis obscured or partially visible	densely tomentose, subtomentose, curling villous or rarely subserriceous, mid and lateral veins raised, evident, reticulum obscured in some races, epidermis obscured or partially visible	tomentose, subtomentose or subserriceous, mid and lateral veins raised, evident or obscure, reticulum evident or partially obscured or partially visible	densely subserriceous or subtomentose, mid and lateral veins raised, evident, reticulum conspicuous, rarely obscure or absent, epidermis not visible	densely sericeous or subserriceous, epidermis not visible, lateral veins evident or obscure, reticulum absent
Leaf shape	oblong to broadly oblong-acute or ovate obtuse, c. 30% of leaf bases strongly or weakly oblique	elliptic, narrowly elliptic, ovate or obovate, leaf bases not oblique	broadly ovate, elliptic or suborbicular, c. 18% of leaf bases weakly oblique (as low as c. 3% in some races)	ovate, elliptic, broadly elliptic or lanceolate, c. 2% of leaf bases weakly oblique	elliptic, narrowly elliptic, ovate, lanceolate or oblanceolate, leaf bases not oblique	usually narrowly to broadly lanceolate, occasionally ovate or elliptical, leaf bases apparently not oblique
Leaf length x width	(25-)42 & 76-80(-106) mm x (16-)30-34 & 56 (-60) mm	(8-)21-38(-49) mm x 6-16(-20) mm	(11-)20-30 & 60(-70) mm x (10-)14 & 36(-39) mm	(12-)46-66(-116) mm x (6-)17-36(-48) mm	(20-)35-100(-135) mm x (7-)15-37 mm	(20-)40-60(-85) mm x (5-)12-18(-32) mm
Conflouescence branching	simple 58-69% 1 branched 16-22% 2 branched 10-12% 3 branched 3-4%	simple 77% 1 branched 21% 2 branched 2%	simple 82-90% 1 branched 9-17% 2 branched 1-3%	simple 30% 1 branched 42% 2 branched 20% 3 branched 8%	simple 43% 1 branched 47% 2 branched 8% 3 branched 2%	simple 50% 1 branched 32% 2 branched 18%
Length of primary peduncle	(0-)2-4 & 8-10(-12) mm	(0-)3-7(-11) mm	(0-)4-5 & 8-12(-14) mm	0-50 mm	0-35 mm	(0-)4-15 mm

Table 1 cont. Summary of major diagnostic characters of *Grevillea burrowo* and allied taxa within the *G. victorae* complex. Where character states show bimodal distributions within or between populations the lower and higher ranges are provided.

	<i>Grevillea burrowo</i>	<i>Grevillea brevifolia</i>	<i>Grevillea oxyantha</i> subsp. <i>oxyantha</i>	<i>Grevillea oxyantha</i> subsp. <i>ecorinata</i>	<i>Grevillea victorae</i> subsp. <i>nivalis</i>	<i>Grevillea victorae</i> subsp. <i>brindabella</i>
Number of flowers per unit fluorescence	(6-)12-18 & 24(-30)	(14-)20-22(-30)	(5-)10-16(-22)	(6-)20-32(-62)	16-68	(20-)38-50(-64)
Floral rachis length and indumentum	(10-)12-20(-32) mm subsericeous	(7-)15-20(-35) mm subsericeous	(6-)8-13(-24) mm tomentose or shortly villous	(12-)20-45(-60) mm subsericeous or subtomentose	8-60 mm densely subsericeous	(14-)25-50(-60) mm, sericeous or subsericeous
Posture of juvenile buds in relation to decurved floral rachis	reflexing to c. 90°	reflexing to c. 90°	most buds reflexing >90°	some buds reflexing >90° in some populations as they mature	reflexing to c. 90°	reflexing to c. 90°
Perianth limb shape and size prior to tepal separation	transversely elliptical, rarely subglobose in side view, face obtuse or subacute (see Fig. 1), midline keeling absent or obscure, 3.8-4.2 mm across, 3.4-4 mm deep in side view	subglobose, midline keeling absent or obscure, c. 3 mm across and deep in side view N.B. the subacute face of the floral limb in collections from west of Mearangaah (Merriangaah) Peak (Costin, NSW 93308) is inconsistent with all other collections of <i>G. brevifolia</i>	acutely to bluntly subpyramidal, squarish face-on with ± straight angles, keeling strongly defined along midline, 3-3.5 mm across at base, 5-6 mm deep in side view	subpyramidal or irregularly subglobose with a short nipple-like contraction present in some populations, midline keeling absent or evident, 2-2.8 mm across, 2.2-3.2 mm deep in side view	subglobose, midline keeling absent, 2.3-2.5 mm across, 2.2-2.4 mm deep in side view	round in side view, squarish face-on, obtuse or slightly subacute, midline keeling obscure to evident, 2.2-2.5(-3.0) mm across, 1.5-1.8 mm deep in side view
Perianth outer surface, size and indumentum below limb	body roundish or squarish in cross section, 18-23 mm long, 3.3-3.8 mm across at widest point near base, 2.2-2.5 mm across at the midpoint, densely subsericeous, hardly constricted below the limb, epidermis red-pink, dorsal tepals 25-28 mm long	body squarish in cross section, 18.5-23 mm long, 2.3-2.8 mm across at widest point near base, 2-2.5 mm across at the midpoint, openly tomentose or subtomentose, clearly constricted below the limb, epidermis red-pink, dorsal tepals 21-24 mm long	body squarish in cross section, 18-25 mm long, 1.8-2.2 mm across at widest point near base, 1.6-1.8 mm across at the midpoint, densely subsericeous to shortly subtomentose, clearly constricted below the limb, epidermis red-pink or occasionally creamy white, dorsal tepals 22-27 mm long	body squarish in cross section, 18-25 mm long, 1.8-2.5 mm across at widest point near base, 2.5-3 mm across at the midpoint, subsericeous, villous or subtomentose, clearly tomentose, clearly constricted below the limb, epidermis pink or red-pink, dorsal tepals 22-28 mm long	body squarish in cross section, 22-25 mm long, 2.5-4 mm across at widest point near base, 2.5-3 mm across at the midpoint, tomentose or subtomentose, clearly constricted below the limb, epidermis red or reddish-pink, dorsal tepals 17-22 mm long	body squarish in cross section, 16-19 mm long, 2.4 mm across at widest point near base, moderately to densely subsericeous, hardly constricted below the limb, epidermis red or reddish-pink, dorsal tepals 17-22 mm long
Ovary and follicle hairs*	always present on ovary and follicle	always absent	always absent	always absent	always absent*	sometimes present on ovary*, absent on follicle

*Note that Stajsic (2010) inadvertently transposed the character states for ovary hairs between *Grevillea victorae* subsp. *nivalis* and *brindabella*.

Taxonomy

Grevillea burrowa Molyneux & Forrester **sp. nov.**

Diagnosis: Differs from *Grevillea brevifolia* in having prominently raised venation on upper and lower leaf surfaces, longer and wider leaves, longer perianth limb and perianth wider at widest point, densely subsericeous and hardly constricted below the limb. Differs from *G. oxyantha* subsp. *oxyantha* in having prominently raised venation on upper leaf surface, juvenile buds reflexing only to c. 90°, perianth limb which is transversely elliptical or rarely subglobose, shorter and wider and not strongly keeled, and a distinctly wider perianth. Differs from all other members of the *G. victoriae* complex excepting *G. victoriae* subsp. *brindabella* with which it shares the unique character of hairs present on the ovary which, in this species, are retained at maturity.

Type: AUSTRALIA, VICTORIA. Burrowa-Pine Mountain National Park. On the Burrowa Walking Track c. 1.5 km N by foot from the junction of the Mount Burrowa Walking Track with Hinces Walking Track. On ridgeline and c. 150 metres down NNW slopes, 1.56 km SE of Mount Burrowa. 28 October 2002. 36° 06' 03" S 147° 42' 28" E; Alt. 1143 m, V. Stajsic 3314, W. Molyneux, S. Forrester, P. Ashton and H. Merkel. On broad rhyolite N-S running ridge line and down NW slopes. Holotype: MEL 2190712A and MEL 2299595 (same collection, comprising a dry sheet and spirit, respectively); Isotypes: AD, BRI, CANB, HO, NSW, K, NY, WELT.

Spreading shrub 1.5–4(–6) m high, 2–4(–7) m wide. Branchlets biconvex to subterete, often longitudinally ridged, becoming terete, densely subsericeous, white with a scattered overlay of tan hairs. New growth

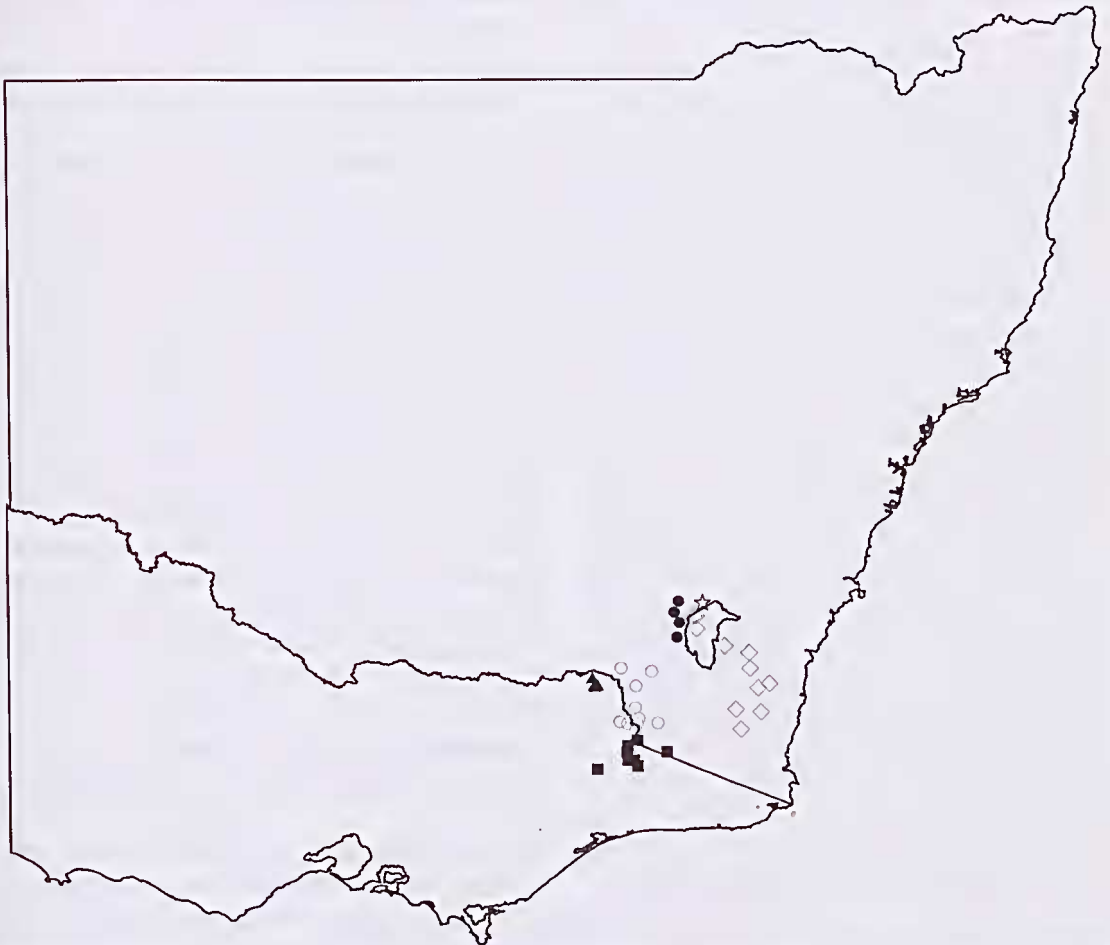


Figure 2. Distribution of *G. brevifolia* (square); *G. burrowa* (triangle); *G. oxyantha* subsp. *ecarinata* (closed circle); *G. oxyantha* subsp. *oxyantha* (diamond); *G. victoriae* subsp. *nivalis* (open circle); *G. victoriae* subsp. *brindabella* (star)

red-purple (RHS 1986 ed. 60c) for c. 3-4 leaves. *Leaves* petiolate, oblong to broadly oblong-acute or ovate, obtuse, c. 30% of leaf bases strongly or weakly oblique, dimensions bimodal: (25-)42 & 76-80(-106) mm long, (16-)30-34 & 56(-60) mm wide; *margins* recurved; *upper surface* initially with tan hairs then silky white subsericeous, imparting a silvery appearance to plants, soon confined mainly to raised mid and lateral veins, becoming \pm glabrous, dullish green; *lower surface* densely sericeous or rarely subsericeous, with or without scattered light brown hairs on raised mid and lateral veins, reticulum irregular or absent, epidermis obscured. *Conflorescence* terminal, axillary or occasionally ramiflorous, declined, decurved or seldom pendulous, simple to branched, simple = 58-69%, one branched = 16-22%, two branched = 10-12%, three branched = 3-4%; *primary peduncles* (0-)2-4 & 8-10(-12) mm long (0.8-)1.2(-1.6) mm wide with a dense white subsericeous indumentum with scattered tan hairs; *ultimate peduncles* (0-)3-4, 7-8 & 12(-14) mm long, (0.8-)1.3(-1.8) mm wide with a dense white subsericeous indumentum with a second open overlay of tan hairs; *unit conflorescence* shortly conico-cylindrical, acropetalous; *floral rachises* (10-)12-20(-32) mm long, 0.8-1.2 mm wide; *number of flowers per unit conflorescence* (6-)12-18 & 24 (-30); *pedicels* c. 5 mm long; *floral bracts* sigmoidal in side view, narrow, margins strongly recurved, c. 3 mm long, 0.6 mm wide at base, 0.3 mm wide at apex. *Immature buds* subglobose, obtuse or subapiculate, reflexed at or less than c. 90° to rachis. *Perianth of mature pre-anthesis flowers* roundish in cross-section below limb, midline keeling absent or, if squarish, then with rounded angles and keeling obscure or absent, c. 18-23 mm long, 3.3-3.8 mm across basally, 2.2-2.5 mm across at mid-point, hardly restricted below limb; *dorsal tepals* 25-28 mm long; *outer surface* below limb red-pink, hardly visible beneath hairs, indumentum dense, consisting of a lower layer of pale silky subsericeous simple hairs and an overlay of light tan and brown or red-brown subsericeous hairs; *inner surface* light pink, dorsally bearded with dense silky hairs commencing 2.5 mm above toral rim and extending for 6 mm, ventral beard commencing 6 mm above toral rim and extending for 5 mm. *Torus* oblique at c. 40 degrees, *nectary* broadly crescentic projecting 1.8-2.0 mm above rim of torus. *Pistil* 20-24 mm long, glabrous but for scattered simple

white hairs on the ovary and style. *Stipe* of ovary 1.5-2.0 mm long. *Ovary* c. 4 mm long, green, with occasional simple white hairs proximally and dorsally. *Perianth limb prior to tepal separation* transversely elliptical, rarely subglobose, obtuse or subacute (Fig.1), nodding, squarish face-on, 3.8-4.2 mm across, 3.4-4.0 mm deep, in side view limb segments not or hardly keeled along midline, densely subsericeous with tan and brown hairs obscuring the epidermis. *Style* pink-red, exerted from dorsal suture, not strongly bowed prior to anthesis, nearly straight or lightly curved, deflexing anteriorly from ovary post-anthesis, 14-18 mm long, style end c. 4 mm long, 3 mm wide, with short scattered white hairs on the back of the style end and on upper style, face of pollen presenter concurrent with style, flat or marginally concave. *Follicles* narrowly and obliquely ovoid to obliquely ellipsoid, glabrous but for scattered, simple white hairs proximally, 18-20 mm long, 8 mm wide, 7 mm deep.

Specimens examined: VICTORIA: Eastern Highlands. Mount Burrowa Walking Track from Hinces Saddle on a broad NNE aligned rhyolite saddle and upper NNW slopes occupying 2.1 ha at an elevation of 1143 m. 36°06'03"S, 147°42'28"E. 1.x.2000. W.M. Molyneux s.n., P. Ashton and K. Rule. (MEL 2090949 (sheet) and MEL 2095073 (spirit), MEL 2090950); Burrowa-Pine Mountain National Park, north on NE ridgeline of early Palaeozoic rhyolite from Hinces Walking Track c. 200 m beyond Black Mountain summit parking area. Several thousand plants over c. 9 ha. Elevation 1198 m, 36°07'22"S, 147°43'03"E. 17.xii.2012 W.M. Molyneux, S.G. Forrester and K. Goyne s.n. (MEL 2371066); Burrowa-Pine Mountain National Park, northern steep bluff end of NE ridgeline off Hinces Walking Track from the Black Mountain summit parking area. Many thousands of plants over c. 12 ha. Elevation 1110 m, 36°05'49"S, 147°44'56"E. 10.xii.2013. W.M. Molyneux and K. Goyne s.n. (MEL 2376436); Burrowa National Park, 23.x.1987, A.C. Beaglehole 89172, and L.W. Huebner (MEL 2109083); Burrowa-Pine Mountain National Park, Range between Mount Burrowa and Lookout Rocks. xii.1978. P.G. Smith (DELWP Arthur Rylah Institute for Environmental Research, Heidelberg, Plant Reference Collection).

Etymology: The epithet recognizes the collection of the type material on a walking track to Mt. Burrowa and also its location in the Burrowa-Pine Mountain National Park in north-eastern Victoria where it is apparently endemic. Unfortunately, due to the extinction of the local language groups (Luise Hercus pers. comm. 2013) the origin of the name Burrowa is not known from the Pallanganmiddang. Barry Blake (pers. comm. 2014)

indicated that Booroowah, the 'White Breasted Diver' in Dhudhuroa, was the closest traditional name that he could find to Burrowa. It is plausible that the 'White-breasted Sea-eagle', also known as the White-bellied Sea-eagle, which still feeds and nests along the Murray River and its tributaries, may be the bird referred to by the Pallanganmiddang and perhaps seen hunting in the vicinity of the present day Mt Burrowa.

Distribution, habitat and ecology: *Grevillea burrowa* is apparently endemic to the Burrowa Plateau in north-eastern Victoria (Fig. 2) where it is currently known only by two populations on adjoining ridgetops and upper slopes c. 3 km apart in the Burrowa-Pine Mountain National Park. The population from which the type collection was taken, comprising many hundreds of plants, is on the Mt Burrowa Walking Track and occupies c. 2.1 ha. The second population of many thousands of plants is on a ridgeline running north-east from Black Mountain where it is subdivided by a narrow rocky saddle into two stands c. 9 ha and 12 ha in extent respectively. The substrate is mid Palaeozoic rhyolite supporting impoverished shallow to skeletal soils.

Associated vegetation is consistently Montane Dry Woodland or Ecological Vegetation Class (EVC) 36 (DELWP 2015) with the species extending into Rocky Outcrop Shrubland/Rocky Outcrop Hermland Mosaic or EVC 73 on northern aspects. Associated species include *Acacia dealbata* Link, *A. lanigera* A. Cunn., *A. kettlewelliae* Maiden, *A. rubida* A. Cunn., *Asterolasia asteriscophora* (F.Muell.) Druce, *Boronia nana* Hook., *Brachyscome diversifolia* (Graham ex Hook.) Fisch. & C.A. Mey., *Bulbine bulbosa* (R. Br.) Haw., *Callistemon pallidus* (Bonpl.) DC., *Coprosma hirtella* Labill., *Dianella tasmanica* Hook f., *Eucalyptus chapmaniana* Cameron, *E. dalrympleana* Maiden, *E. dives* Schauer, *E. mannifera* Mudie, *E. pauciflora* subsp. *pauciflora* Sieber ex Spreng., *Grevillea jephcottii* J.H. Willis, *Kunzea parvifolia* Schauer, *K. peduncularis* F.Muell., *K. parvifolia* × *peduncularis*, *Leonema lamprophyllum* (F.Muell.) Paul G.Wilson, *Leptospermum micromyrtus* Miq., *Lomatia ilicifolia* R. Br., *Pelargonium australe* Willd. and *Persoonia chamaepeuce* Lhotsky ex Meisn.

Phenology: Flowering has been recorded in late winter, spring, summer and sporadically in early autumn. *Acanthorhynchus tenuirostris* (Eastern Spinebill), and *Lichenostomus penicillatus* (White-plumed Honeyeater) are the two most active nectar feeders recorded on

Grevillea burrowa during the cooler parts of the day in late spring and early summer. The observed activity of nectarivorous birds suggests the species is primarily ornithophilous. The species is apparently an obligate seed regenerator.

Conservation status: We estimate the age class distribution to be ca. 15% veterans to 4-6 m height assumed to have germinated following the 1952 wildfire, ca. 50% mature plants of intermediate size and apparently representing a sequence of germination events independent of fire, and ca. 35% seedlings and juveniles. Very few dead older plants are evident. The overall impression is of a healthy regenerating population. It is important to note though, that there have not been any landscape scale fires in this section of the Burrowa-Pine Mountain National Park since 1952 (Kelton Goynne pers. comm.). A localized fuel reduction burn was carried out in 1994, but there is scant evidence of this now.

Area of occupancy (AO) is estimated at 23 ha and extent of occurrence (EO) is estimated at 4.5 square km. Total population is estimated at 2000-4000 mature individuals. There is no evidence to suggest significant decline in population size since European settlement nor any significant population size fluctuations. Projected climatic drying and increasing frequency of extreme high temperatures are expected to result in increased mortality through drought stress and increasing risk of severe fire events and recruitment failure to drought stress, repeat fire events resulting in reduced seed production and, potentially, increased risk of herbivory by the exotic deer *Cervus unicolor* (Sambar). Longevity is arguably well in excess of the inferred age of the current cohort of 60 years and is plausibly 80-100 years. Continuous recruitment between fire events demonstrably occurs as inferred by the observed size class distribution. However, since the species is fire sensitive, resulting in mortality of all severely burnt individuals of all age classes consumed by each major fire event, generation time is interpreted as the mean frequency of wildfires which resulted in mass episodic seed recruitment. Such fires are assumed to have been ignited by lightning strikes which are common across the Burrowa Plateau. Based on the inferred time since the last major fire in the area, fire interval is inferred to be in the range of 50-100 years. Projected decline in population size in the next century, due to factors

discussed above, is estimated to be at least 30%. The species is therefore assessed as critically endangered since it qualifies very confidently under the following IUCN (2001) criterion:

CR B1ab(iii)+2ab(iii)

and also qualifies very confidently as vulnerable under the following IUCN criteria:

VU A3ce; C1; D2.

Notes: This is only the second occasion that hairs on the ovary or follicle have been recorded for a member of the 'linearifolia group' sensu Makinson (2000). The only previous record was for *Grevillea victoriae* subsp. *brindabella* (Stajsic 2010). This character permits the key to members of the *G. victoriae* species complex provided by Stajsic and Molyneux (2006) to be modified, by the insertion of a zeroth couplet at the start and the addition of a final couplet, to accommodate both *G. burrowa* and the only other recent addition to the complex, *G. victoriae* subsp. *brindabella*, as follows:

0. Hairs absent on ovaries and follicles 1
- 0a. Simple or biramous hairs present on ovaries and sometimes also on follicles 28
28. Hairs patent, simple, white, scattered on ovaries and follicles; branchlet indumentum densely subsericeous; leaf upper surface ultimately dullish green; leaves oblong to broadly oblong or ovate, (25-)42 & 76-80(-106) mm long, (16-)30-34 & 56 (-60) mm wide; flowers per unit conflorescence (6-) 12-18 & 24(-30) *G. burrowa*
- 28a. Hairs patent, simple or biramous, white, scattered on ovaries but absent on follicles; branchlet indumentum densely sericeous or occasionally subsericeous; leaf upper surface semi glossy or distinctly glossy; leaves usually narrowly to broadly lanceolate, (20-)40-60(-85) mm long, (5-) 12-18(-32) mm wide; flowers per unit conflorescence (20-)38-50(-64) *G. victoriae* subsp. *brindabella*

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two subsequent field trips with Kelton, the known area of occupancy of *G. burrowa* in the park grew from c. 2.1 to c. 23 ha. Curation Co-ordinator at MEL, Catherine Gallagher, has cheerfully provided access on numerous occasions to particular collections to further our research, and facilitated the transfer of loan material to La Trobe University for the convenience of one of us (WMM). Alison Vaughan (MEL) very generously produced the distribution map at short notice, while Susan Hoebee and Alison Kellow of the La Trobe University Department of Ecology, Environment and Evolution have been welcoming and continually supportive of the research for this project by facilitating the transfer of loan material and by providing space, facilities and access for one of us (WMM). Former Ranger at the Tallangatta Parks Victoria office, Peter Ashton, initiated the research for this paper by bringing to our notice the type locality of *Grevillea burrowa* in 2000, and Val Stajsic accompanied the authors on the second and type material collecting trip. We also wish to thank two anonymous referees whose combined knowledge has enhanced certain aspects of this paper. Last but not least we thank David Cameron for his unequalled editorial assistance and guidance regarding conservation status assessment.

References

- DELWP (2015) Victorian Department of Environment, Land, Water and Planning Biodiversity Interactive Map accessed online 22 January 2015.
- McGillivray, D.J. and Makinson, R.O. (1993). *Grevillea*, Proteaceae: a taxonomic revision. Melbourne University Press: Carlton.
- Makinson, R.O. (1997). New segregate species and subspecies from the *Grevillea victoriae* (Proteaceae: Grevilleoideae) complex from south-east New South Wales. *Telopea* 7, 129–138.
- Makinson, R.O. (2000). *Flora of Australia*, vol. 17A, Proteaceae 2: *Grevillea*. CSIRO Publishing: Collingwood.
- Molyneux, W.M. and Stajsic, V. (2000). *Grevillea victoriae* subgroup (in part only). In R.O. Makinson, *Flora of Australia*, vol. 17A, Proteaceae 2: *Grevillea*, pp. 247–264. CSIRO Publishing: Collingwood.
- Stajsic, V. and Molyneux, W.M. (2006). Taxonomic studies in the *Grevillea victoriae* F.Muell. species complex (Proteaceae: Grevilleoideae) 1. Descriptions of nine previously segregated, and three new taxa. *Muelleria* 22, 19–76.
- Stajsic, V. (2010). *Grevillea victoriae* subsp. *brindabella* (Proteaceae) from the Southern Tablelands of New South Wales. *Muelleria* 28(1), 18–28.